

Math and the Preschool Child: High Five Mathematize

Vanessa Maanao-French: So, let's get started chatting about math. So, we're going to talk about math and the preschool child, and we're going to specifically focus on this resource called "High Five Mathematize." So, we'll jump right in. So, you probably recognize my voice by now, and if you haven't, that's okay; you will by the end of this webinar. My name is Vanessa Maanao-French, and I am here at the National Center on Quality Teaching and Learning. We're based out of Seattle, Washington, at the University of Washington. And it is my honor and privilege to work specifically with AIAN grantees throughout the country, and I'm happy to be with you. And alongside me today is Dawn. Dawn, do you want to say hi?

Dawn Williams: Hi, everyone. This is Dawn Williams, one of the curriculum specialists here at NCQTL, and I'm also the project manager for the webinars. So, if you have any questions or anything you need technology-wise, please just put it into chat, and I will try to help you.

Vanessa: So, you might be seeing some things pop up that say Susan Stewart. She's not actually with us. Dawn is playing the role of Susan today. Susan is on a very well-deserved vacation. We'll think about her and we'll be happy for her, even though she's in Hawaii and none of us are. [laughs] We'll wish her only good thoughts. But, Dawn is great behind the scenes; so if you have any questions, just pop them into general chat and she'll get right back to you.

So, today, this is what we plan to do. We're going to talk about what does it mean when we say "mathematize." We're going to offer some examples and strategies to incorporate math into the classroom. We're going to connect it back to the Head Start Child Development and Early Learning Framework. It all has a purpose. And then finally we're going to provide some suggestions for improving teachers' skill in this area.

So, let's start with a quick question, okay? So, let's talk about your own teaching teams that you have. So, when it comes to teaching math concepts and skills on average -- so think about your whole team -- how is your team doing in this area? Are they innovative and energized, doing new things all the time? Or is it more B, that they're confident, but only when they have something that's really prescribed in a math activity?

Or finally, is it C, they're kind of uncomfortable? Maybe, they need some more training and support. Looks like, at least from our group here today, on average, your teaching teams really don't have a real strong, confident feeling when it comes to providing math activities in the classroom. And we've got a mix, but we still have more that are really tentative and uncomfortable when it comes to math, and that, you know, is actually fairly typical. And so, let's actually just keep this conversation going a little bit more, and so tell me what your thoughts are. What do you think contributes to this lack of confidence that you're seeing in your teams?

I'm seeing some trends in your thoughts. So, training seems to come up over and over again. And also just the kind of knowing what to do. Oh, thank you for that, Elvira: The veteran teachers like what they've been doing for years, and they're reluctant to try new things. And, yeah, I've been there, too. I have both been the teacher and supervised teachers who have the September box, the October box...[laughs] and so thinking outside the box is -- you know, the September box, is sometimes hard to do. But the idea about training activities and resources -- maybe, that's something we can address today. And one other thing I want to be sure that we note is that doing math is something that happens throughout the day, and that's really the whole idea of mathematizing.

But let's go back to the importance of why we're even talking about math to begin with. And this is, I'm sure, part of your reality, and you know this, and -- but it's important to say. That there is a significant math gap at kindergarten entry for children who are low income, and we're talking about our kids. You know, in Head Start, we serve the kids who are most at need. These are our children. So, they're already coming in behind, when it comes to math at kindergarten. And the other important thing to note is that early math skills in kindergarten really predict not only how they do in math, but how they do in reading by the time they reach the fifth grade. So, we can't underscore the importance of learning these really basic math skills at an early age. And truly kids are ready to take this on.

And, you know, if presented in the right way, kids, you know, they gravitate; they love it. We talked about science before. Science and math lots of times go hand-in-hand, and it's all a matter of presentation and the way you engage and excite children to learn. So, connecting it back to the framework. And this one's actually pretty easy, because it's got its own little section of the pie.

And there's quite a bit of things here. Number concepts and quantities, number relationships and operations, geometry, patterns, and measurement. And it's a lot to cover, and we certainly can't do it all in one hour. And so we're really going to focus on just a couple. We'll focus on number concepts and quantities, number relationships and operations, and also patterns today. And we're only just going to skim the surface, but at least we'll get a taste of what it's like to mathematize, when it comes to integrating these skills and knowledge into the classroom day. And I'm going to draw a lot of this from this guide called "High Five Mathematize." And it really does go more in-depth into these math knowledge and skill areas. It offers resources and ideas for in the classroom, as well as, training of staff for infants, toddlers, and preschoolers, which is probably great news for you out there that have 0-5 or who work with Early Head Start children.

And what's nice, too, is that there's ideas about taking it for home base as well. So, it's not classroom-centric, as lots of times things are. There are actually great ideas about how to engage families. So, I hope you know this, and it's been put into the general chat for you, but you can get this on ECLKC, or "e-click," just by clicking that little link that's right there in your chat that Dawn just placed for you. And it's a big document, so, you might want to just save it to your computer. You'll want to print it at some point; but it's bigger, okay? It's a big PDF, but it's chock full of really good information and resource. Let's get to the basics.

Math ideas are in children's play and what they do the moment they enter the classroom each day. So, it's guided through self-discovery. So, when they're in that block area, it's all about math. It's all a matter of how we guide their thinking about what they're doing as well as how we comment and question them to bring those math skills into play. And it really is important that adults be engaged in it. And it's not a scary thing. It's actually super, super fun. And we'll show you what I mean.

So, when we talk about mathematizing, it's about how we bring out the math in what children are already doing. So, let me give you some examples. This little guy on the slide here is looking at how fast the ball rolls down the slide, and there are some good questions that a teacher can ask, like, "How fast is the ball rolling?" "You stayed up on top of the slide but the ball kept rolling down," or "The ball went faster than you did. Why do you think that is?" And it brings into question for the child and their thinking spatial concepts, shapes -- you know, the geometry; the ball rolled faster because it's round -- and also speed and comparison. And leaving those open-ended questions there for the child to ponder.

This is math, and I think this is where teachers feel they're not doing math when they actually are doing math. It's a matter of recognizing, almost translating the questions that they're asking children to help teachers recognize that they are engaging children in thinking in math. So, adults mathematize children's experiences when they emphasize math concepts and relationships, they use mathematical language -- and we'll give you some nice new terms in just a bit -- they make comments, ask and answer questions, and pose math-related problems to children, much like the little boy in the slide: Why did the ball roll faster than you did down the slide? And finally, they provide a variety of materials and tools for exploring math ideas. And I love this little girl's face. [laughs] "What?!"

So, here is a great example, and this could be anywhere -- a home visit; it could be in your dramatic play area. But this whole idea of a child putting on a big pair of shoes. And where could you take this exploration? You know, it's -- you can talk about how small the child's foot is in comparison to the big shoe; you can talk about -- oh, that's a good one -- how far can you walk in these big shoes before you lose your balance and trip. That's a great question. It's mathematizing. Because, now we're talking about size, right? Big and little, long, short. You're comparing objects -- the child's feet in a shoe versus the size of the shoe -- and also distance and measurement. So, it's so simple. And yet I think we think it too much. We think about it too much. We try to make it difficult. And this is where children get engaged in math. It's calling attention to it, right?

So, here's another example. So, you have a child in the block area, and it's just simple questions or comments. You know, "Tell me how you chose the blocks for your structure," right? The child can start answering the questions based on their experience using the blocks. The child now knows, "I can't put the two skinny cylinders on the bottom and expect the really long, heavy one to balance." Maybe, she needs six cylinders to make it balance, and she's figured that out. And that, to me, is a lot of physics, which is kind of going back to our science, but also still math. It's about spatial relationships again. And you see this often in block areas, that kids will create structures that are symmetrical, right? So, calling attention to those things. "How did you make the two sides of your block house look the same?" Right? Calling attention to it. Offering those words like "symmetry." They're absolutely ready for it. Calling attention to the patterns that they're using to create their structures. Kids often do this. Calling attention to it is mathematizing it.

So, another example, and this happens every day, and we often don't think of this so much as math, but there's math embedded within it. Your circle times every single day include songs with repetition and pattern. You have songs that include numbers. You know, "Five Little Monkeys," hey, five little monkeys. That's also counting backwards. That's a pretty big deal. So, it's a matter of rethinking what we already do and calling attention to it. So, I want you to try one out. This one's kind of fun.

Share your thinking in chat. What math connections could you make in the exploration of shadows? Especially now that the sun's up and with us more often each day. What are some of your ideas? What math concepts could be drawn from shadows? You guys are good. Thank you. We're actually -- I put myself on mute so we can comment as your comments come in. We're, like, very impressed. So, the idea of size and comparison, shapes and sizes, measurement, which is great. The spatial -- you know, behind, in front and behind; that's wonderful. When you -- that behind thing makes me think about if the child were to stand in front of the adult, they would almost disappear, right, into the shadow. And so thinking about that, and then one of the last ideas that came in was about, oh, graphing. That's -- yeah, that's awesome. And then using the time of day, that is so smart. Doing it in the morning, you know, and then doing it again after lunch or before the kids get on the bus, just to show how the sun has moved but you stood in the same place. Ah, shadow movement! The sun moves!

But then that opens up a whole new conversation, doesn't it? Now, we start getting ourselves into the area of science, which is great. Like I said, they go hand-in-hand. Sometimes hard to take them apart. But then from that one measurement about shadows and time of day, you start thinking about a movement of the sun, the rotation of the Earth. Oh, my goodness! It's a fabulous idea. And what was great about seeing your comments come in is that both Dawn and I have children of our own, and we get excited about these ideas. "I'm going to do this when I go home!" [laughs] So, believe me, we definitely get things from you all as well. So, thank you for sharing your thinking with us.

So, let's focus a little bit. And again, I'm just skimming the surface of what's available in "High Five Mathematize," but number concepts and quantities. And, you know, this is the simple stuff, the stuff that teachers do pretty well all the time, right? Being able to count small groups of objects and label them with numbers, to be able to compare sizes of groups, and in real-life situations, be able to share evenly with their friends when it comes to toys or snack, right? So -- but what are the children actually learning? When we talk about combining and separating, it's those tasks of adding and subtracting, even multiplying and dividing.

So, even this simple puzzle that we're showing here is really about multiplication and division, fractions, okay? So, it's a matter of recognizing that and telling children what they're doing. Sharing with parents, "You know, when they're working on this puzzle, this is what they're really getting the foundations for: Addition, subtraction, multiplication, division, and early fractions." And when you say it that way, parents will be like, "What?!" It's impressive.

But that's learning through play, and this is what kids do so naturally. So again, recognizing and acknowledging what's already there. One-to-one correspondence. Now, this is something that's developmental as well as something that can be nurtured, but being able to match one and only one number word to each object. So, this little kiddo who's counting the number of dots on a domino -- very simple -- and matching it with the number. Simple task, but one that takes time.

Now, here's another one. How often do we throw this word around, "cardinality," right? Knowing that the last number counted gives a total number of objects in the group, okay? So, you could just look at this -- you would count, and at the end, you would say, "Well, how many bears is that? 1, 2, 3, 4, 5, 6, 7, 8, 9. 9." And you would just say, "How many are there? 9." Is that really 9? Yeah. I had to double check. But it is also something that children need practice doing. Because, what often happens, especially in young 3s, is they'll count all the way through to 9, and when you ask them how many, instead of saying 9, they'll just start counting over again, right? So, that's a skill that needs to be nurtured.

Here's my favorite word of all time. Now, I say "subitizing." Some people say "soobitizing." Subitizing/soobitizing. Tomato/tomahto. What it really means is that a child is able to look at a small group of objects and know automatically without having to count how many there are. So, you're all looking at this slide. How many binder clips are there, right. Quick. Easy. Three, right? That's a skill that takes children time to learn. However, it can be nurtured, if teachers are intentional about it and recognize it. And these slides that I've just shared with you about cardinality and subitizing, share them with parents. I think that's great, right? Have them recognize these benchmarks in children's growing math skills.

Now, this last one is probably the -- along the spectrum, the toughest one, right, because you're just going to have to look and immediately know. My 3-year-old probably would have to count. I would hope by the time she's 4, she can say, "Oh, that's 3." But again, it takes nurturing and time. So, let's watch a video that kind of shows some of this stuff in action. And as a preview, what I'd like you to do is to kind of identify what counting skills, since that's what we were talking about, you can tell this child knows. And then also, since we're all ed managers, think about what skills you might want the teacher to do next to support this child's learning.

[Video begins]

[Children chattering in background]

Boy: 1, 2, 3. 3?! Aww. 1, 2, 3, 4. 4. 1, 2, 3, 4, 5, 6, 7, 8. 8. I just did 8! Awww! Oh! 1, 2, 3, 4, 5, 6. 6. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. 11. I just did 11!

[Video ends]

Vanessa: Okay, as usual, very impressed. Thank you, thank you. I'm just going to scroll through your responses again. So, yes, I think you guys really got the gist of what he was able to do with this little game, right? He was able to -- to count. Has that one-to-one correspondence when it comes to it. He's able to do cardinality; that's great. Throwing out the lingo, love it. To be able to know that the last number he counted is the total. Fantastic. And then on the flip side, too, you know, subitizing -- it would be great for him to be able to see what's on there, not have to count each little dot, right? And then somebody also mentioned very simple addition. Once he's subitized that, right, he's able to know that when the die looks like this, that's 2, this one is a 1, 2 plus 1 is 3, done, right? So, quick thinking about this little game. It's great that it comes in a little box with the little dudes that you can -- there probably is a better word than "little dudes" for those little things. To be able to mark where he's already counted that number.

But this could be so easily replicated. Just have your die and just numbers on cards. And the child will flip over the card once he's finished with that one. So, really simple to do. But this is a fun little activity, and something you could even take to parents, because, chances are they probably have a board game around. And if not, you know, dice are pretty cheap. Maybe, that's something that could be done at a parent event, when you're talking about math is creating these types of things. Even creating dice out of paper or cardboard would be another option. It's a way to really incorporate math and to start teaching these words that you guys are throwing around so well: Cardinality, subitizing. It's great. Awesome. You guys get it.

So again, this wonderful, wonderful guide for you, available online. It's still there in chat. So, they do offer these ideas, again, about how to support -- to help adults support children. Here's, you know, a quick screen shot of what one of the pages on infant/toddler development has there. So, you have some ideas about what materials you can offer, things that you can do for your parent groups, and then some of that key vocabulary that infants would need to start learning to really build a strong foundation for math.

And they have similar pages -- and again, I'm only taking one quick page to give you a taste of it -- for preschool children. So, it provides examples of what adults can do, really, specifically, what they can do to really encourage math. All right.

So, it's great that we had the dice in the first video clip, and now we're going to talk about patterns. Because, we all recognize the patterns on dice, right? You know when it's a 5, you know with those dots -- they're always the same. Patterns, right? So, these are really important for children in the area of math, because, it helps them later on when it comes to all those other higher-order math skills and problem-solving. So, when we think about patterns, it doesn't have to be limited. And there are patterns in our everyday life that we can call children's attention to, and this counts as math, okay? So, it's those traditional weavings that we have in our baskets or in paintings; it's the rhythms of dancing and drumming; it's the patterns we can find in nature, right? So, calling attention to those and making math a living thing and something that's also very culturally relevant, I think, is key to getting children to be interested, but also to find ways for parents and elders and others in the community to find a place to teach children math in their own way.

So, when we talk about patterns -- they can be, you know, a couple of different ways. They can be repeating patterns, and that's pretty simple. Yeah, I think that's pretty straightforward: They repeat. Or we have growing patterns, when they change in value in a predictable way. So, largest to smallest, smallest to largest, okay? And when it comes to the skills children need to learn, with regard to patterns, they need to be able to recognize that the pattern exists. They need to learn how to copy a pattern, okay? To describe it, to be able to tell somebody with words about what a pattern is. To be able to create one on their own. And then finally to be able to extend a pattern, okay?

So, we're going to watch another quick little video, and -- that involves patterns. So, again, identify what skills the children already understand, but then, also what could a teacher do next to help children deepen their understanding of patterns?

[Video begins]

Teacher: Ready, Tess? We're going to be working on patterning. Do you want to help us working on patterning? Okay. So, Tess, let's try to work on patterning right here. So, we do green. And what color do you want right here? We're going to choose a different color.

Girl: Red.

Teacher: Red? Okay, how do we --

Girl: Right there.

Teacher: Right there, look. That's right. And then we put it next to each other. And then what goes next after it?

Girl: Um...

Teacher: I think this color.

Girl: Yellow!

Teacher: How about this color? This one. What's this one, Shia?

Tess: Blue.

Shia: Blue.

Teacher: Green. This one's green. So, let's find a green one.

Shia: There! There! There!

Teacher: Oh, right here?

Shia: Yeah.

Teacher: Oh, you found it. Okay. So, it goes green... What color's this one?

Tess: Red.

Teacher: Red. And then this one. What's this one?

Tess: Green.

Teacher: Green. And let's find another -- this one. What's this one?

Tess: Red.

Teacher: Red. And then where does it go?

Tess: Uh...

Teacher: Can it go here or can it go here? We're making a pattern. Okay, put it right here. Perfect! So we have red, green, red, green. We made a pattern. So, let's make a different one.

[Video ends]

Vanessa: So what patterning skills do you think these two little girls understand? And then, what might be the next skill that they'll need to learn? All right, so this is a very different video than the first one, as far as children in the video's mastery of math concepts that are being presented. So, in our first video, that little guy was independent, right? He was able to do the counting on his own; he knew how to work the little game pieces, and in this video, these little girls are considerably younger, especially, the girl who's standing up -- she's only 3 years old. And so, for her, it wasn't just the patterning piece, and I think you guys mentioned this, too, is that not necessarily knowing for sure that she knew the colors. I think she could recognize the pattern, but naming the colors would make it difficult for her to be able to name the pattern, be able to really share the pattern with another person, right?

So, I think you guys have really gotten this. The teacher really has to do a bit more very intentional, basically hand-over-hand help for these two little girls to understand, one, the concept of patterns and how to create one and how to extend one. She was really walking them step by step through the process, including, "Well, where do we put this red block? Do we put it here or here?" And I think that you guys really were able to identify that. And as far as where it could go next, you know, extending the pattern to include more colors, having the child be able to do it more independently would be great as well. But you can see how, based on experience, based on developmental age and stage, that when it comes to mathematizing, sometimes it needs to be a bit more hands-on.

Sometimes, it's the comments and questions we ask that can really invite further conversation around math topics. And sometimes, as in the case with our first video, it really is a really discrete activity that a child gets to practice their math skills; so, it is a spectrum. So let's move on a little bit.

So, again, back into that great guide. There are some ideas for professional development. So, what could you do for your next staff meeting to encourage conversations like this among your staff? So, there are discussion questions; there are learning activities. This really could shape your very next professional day with your teachers. You're welcome. Ta-da, it's already done for you. Just using a couple of these math topics could be very worthwhile. And it may, you know, be something you want to think about over the summer to really incorporate intentionally over the next school year: How are you going to introduce and emphasize math at each of your in-service days throughout the entire year?

It is one of those things, if you don't use it, the day goes by so quickly and you miss those opportunities that you could really capture children's thinking and teacher's thoughts and planning around math. So, again, it is for infant and toddlers, as well as, for preschool staff. And there's -- what's also nice, too, is that it can refer you back to webcasts that are available still online around math that may give you even more ideas.

Okay, so starting to wind down a little bit. We're going to do some summarizing, and then we'll talk about some more resources. What's key and I hope that you take away today is that children will learn math skills naturally through their everyday experiences. It doesn't have to be something that is a ditto or a workbook or a specific activity. It's great -- specific activities that are designed for math are wonderful, but it's really more about calling attention to what they're doing every day and pulling the math from that. So, children do need a lot of different experiences to understand those math concepts.

I am sure the teacher in our second video is going to revisit patterns again and again with those two girls and not just in the block area with red and green blocks, right? You want to provide a variety of experiences to support different learning styles. Maybe, children will learn patterns best through the rhythms of drumming, and that's wonderful. You can start with things that are simple and then work towards things that are more complex, but always, always be patient with children, because, you know, as adults, we still do make mistakes. But as we make those mistakes, that's where we really grow, and it becomes -- that knowledge becomes our own.

So, before I leave you today in the next few minutes, I just wanted to show you a few more math resources, because, we've really been emphasizing "High Five Mathematize" and that wonderful guide. So, I hope you all get a chance to take a look at it and really dive deep into it. So, if you go on to the NCQTL website page on ECLKC, we do have different links that will get you to math stuff. So, under "Effective Practice" and "Research-Based Curricula" and "Teaching Practices" -- this is one of the pillars of the house as well -- you will be taken to this page, and on that page you'll see -- see how it's just woven so nicely together for you? You have the Head Start Framework and then each of the different slices of the pie. And just clicking on that will take you to some more resources, including a link, again, to the "High Five Mathematize" guide.

Whoops, need to go back one. As well as more resources for each of those math knowledge and skill areas. Oops, went the wrong way. Little arrows are just jumping up and down all over the place. Another place to find it would be to look under -- still within our page, under the "Quality Teaching and Learning" page -- "Early Childhood Development." And you have to just play around. You'll find all these wonderful things: "Focusing on Child Development." And then we have a whole section on math, which will give you another long list of resources that you can use around the area of math.

So, this is just is another way to get to the same information, but that link may be a nice quick one for you. And actually on your own web page that you're looking at right now on your screen, you should be able to click on that link, and it'll take you right to this long list of resources. Okay, and finally I want to be sure that you know about these as well. These are the Front Porch series that we've had around the area of math. And we've had two really wonderful ones. It really does -- I mean, "mathematizing" is the first word of the first one on the list, which is great, we just talked about that. So -- and this talks about including math in children's books, which is wonderful. So, we often don't think about math in stories, but it's so embedded. And then also around play and math. So, I would offer that you take a chance, if you have time to be able to -- you can click on these, too. These are also live. Click on them, too, and they're about 45 minutes, right? And so -- and they are with some of the leading minds in the country around this topic. And you will have the opportunity to be able to listen to them speak as well as see their slide presentation, and at the end, typically there's time for just a few questions from those that participated, and you can hear the answers to those questions as well.

So, that's another great resource for you I want you to know about. Fantastic. I mean, really, I'm hoping a takeaway, too, was that math doesn't have to be complicated. Children are offering us opportunities to talk about math all the time. So, again, thank you so much for joining me. I know how busy your schedules are every single day, and the fact that you carved out this hour for us means so much. So, as you are leaving, please do, if you can, click on the evaluation link that Dawn just put into chat for you and give us your comments and feedback; because, it certainly does help us make these better for you each time. So, enjoy your day. Thanks again.